DRAFT

Conceptual Approach to Communicating and Using the Preliminary Estimate of the Nature & Extent of Arsenic and Lead Soil Contamination

Concept

- The preliminary estimate points to areas where heightened awareness of the potential for elevated levels of arsenic and lead in soil is warranted because of impacts of smelter emissions, historic use of lead arsenate pesticides and emissions from the use of leaded gasoline. The estimate does not, and is not intended to, predict the locations or concentrations of arsenic or lead in soil at individual properties – these predictions are not possible given available data.

- Areas where heightened awareness of the potential for elevated levels of arsenic and lead in soil is warranted should be communicated on appropriate maps. The scale of the maps should be commensurate with the precision of the data available for use in creating the estimate.

- The maps should be supplemented with information allowing property owners and others to refine their understanding of area-wide soil contamination. Two types of refining questions should be used to increase understanding: (1) questions that address the location and historic uses of a property, and, (2), questions that address the potential for exposure to any arsenic and lead that may be present based on current and potential future property uses.

Mapping Options

The purpose of the maps is to communicate where there should be heightened awareness of the possibility for elevated levels of arsenic and lead in soil based on smelter emissions, historic use of lead arsenate pesticides and emissions for the use of leaded gasoline. The maps use different scales for different types of data – data on historic use of lead arsenate pesticides is presented on a county basis, data on smelter emissions is presented on a smaller scale.

Figure 1 is a map of the entire state. It shows the likelihood that a county has land with elevated levels of arsenic and lead from past use of lead arsenate on apple and pear orchards. Counties were grouped into 3 categories based on number of apple and pear trees present between 1905 and 1945, and were color-coded according to group, with darker colors showing a higher likelihood of elevated levels.

Figures 2, 5, 6 and 7 show areas potentially impacted by smelter emissions. These figures could be easily converted to color for the purpose of communicating areas with the potential for elevated levels of lead/arsenic in soil.

Options for Refining Questions

The refining questions are divided into two groups. The first group of questions might be used to refine understanding of the potential for elevated levels of arsenic and lead in soil at an individual property based on the property location and historic uses. The second group of

questions might be used to refine understanding of the potential for exposure to any arsenic and lead that may be present, based current and potential future property use.

Questions about Potential Soil Contamination from Lead Arsenate Pesticide

1) Is the property located in an area that was once used for agriculture, or is it possible that your property was once occupied by a backyard garden?
2) If your property is located in an area once used for agriculture, did an orchard occupy the property at any time from 1900 to 1945? Was the orchard type apples, pears, or some other fruit? If you suspect that your property was once occupied by a backyard garden, is it possible that apple and/or pear trees were grown on the site at any time from 1900 to 1945?
3) Do you know what your property looked like before it was developed in its current state? Is it likely that soil grading occurred on your property site prior to or during its development? If lead arsenate pesticide had been used on your property, it is likely that elevated concentrations are limited to the top ___feet of soil. If excavation and redistribution of soil occurred at your property, the top layer of soil may have been excavated and redistributed elsewhere, causing soil concentrations to decrease through dilution.
4) Is it possible that offsite fill was used on your property during its development? If you suspect that imported fill was used on your property and you live in an area formerly occupied by apple and pear orchards, contaminated surface soil may have been moved to your property for use as fill.

If the property is known or could have potentially been occupied by an apple or pear orchard at any time during the time period 1900 to 1945, lead arsenate pesticide may have been used to control codling moth on the trees, and elevated lead and arsenic may be present in surface soil (top 3 feet of soil).

Questions about Potential Soil Contamination from Smelter Emissions

1) Is the property located within the area defined as potentially impacted from past smelter emissions?
2) Do you know what your property looked like before it was developed in its current state? Is it likely that soil grading occurred on your property site prior to or during its development? If smelter emissions had impacted your property, it is likely that elevated concentrations are limited to the top ___feet of soil. If excavation and redistribution of soil occurred at your property, the top layer of soil may have been excavated and redistributed elsewhere, causing soil concentrations to decrease through dilution.
3) Is it possible that offsite fill was used on your property during its development? If you suspect that imported fill was used on your property and you live in an area potentially impacted by smelter emissions, contaminated surface soil may have been moved to your property for use as fill.

If the property is located within the area defined as potentially impacted from past smelter emissions, elevated lead and arsenic may be present in surface soil (top 3 feet of soil).

Questions about Potential Soil Contamination from Leaded Gasoline

1) Is the property adjacent to a road that was present prior to 1975?
2) Prior to 1975, did average daily traffic on the road exceed _____ vehicles per day; OR, is the property adjacent to an intersection where traffic would stop and idle for any time; OR, has the road been in place for more than _____ years?
3) Are there areas of the property that are frequently used (gardens, play areas) within 60 feet of the road?
4) Do you know what your property looked like before it was developed in its current state? Is it likely that soil grading occurred on your property site prior to or during its development? If leaded gasoline emissions had impacted your property, it is likely that elevated concentrations are limited to the top ___feet of soil. If excavation and redistribution of soil occurred at your property, the top layer of soil may have been excavated and redistributed elsewhere, causing soil concentrations to decrease through dilution.
5) Is it possible that offsite fill was used on your property during its development? If you suspect that imported fill was used on your property and you live in an area potentially impacted by leaded gasoline emissions, contaminated surface soil may have been moved to your property for use as fill.

If the property is located within the area defined as potentially impacted from leaded gasoline emissions from vehicles, elevated lead may be present in surface soil (top 3 feet of soil).

Questions about the Potential for Exposure Based On Property Use

If elevated levels of arsenic and lead are suspected based on the answers to questions about property location and history, the following types of questions might be used to further refine thinking about the need for response actions (or the types of response actions that may be appropriate) based on the potential for exposure to any arsenic and lead that may be present.

1) Is the property an industrial facility occupied by adults only, or is it a commercial, residential, or other type of property that may be occupied by children part or all of the time (for example a park)?
2) Is exposed soil present on the property, or is the soil covered with buildings, grass, or landscaping?
3) Is the property a location where children will congregate (residential, park, school, daycare)?

Discussion of Potential Response Actions

Response actions in this context might include sampling to define arsenic and lead concentrations, actions taken to mitigate the potential for exposure, or combinations of these activities.

Sampling

Depending on the answers to the refining questions, individuals may decide (or the Task Force may recommend in certain circumstances) that soil sampling be carried out. Soil sampling

guidance has been developed by Ecology to assist you in testing soil on your property. This guidance is designed with different soil sampling plans, depending on the land use of your property. Soil sampling according to Ecology guidance will allow you to verify whether lead and arsenic soil concentrations on your property are elevated relative to natural background.

Methods to Mitigate the Potential for Exposure

Depending on the results of soil sampling, or as an alternative to soil sampling, individuals may decide (or the Task Force may recommend in certain circumstances) to proceed with taking certain protective measures on your property to minimize the potential for contact with these soil contaminants. If elevated soil concentrations are suspected to be present or found to be present after sampling, the following measures can be taken to reduce potential contact with lead and arsenic in soil (attach matrix or ladder diagram linking protective measures to concentrations detected in soil).

The last Figure, which does not have a Figure number, is ladder diagram that shows contamination levels on the left (with no specific levels identified) linked to certain types of protective measures on the right. The six categories of protective measures are those that are under discussion in the protective measures subgroup.

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WHATCOM
SAN JUAN
SKAGIT
OKANOGAN
FERRY
PEND ORIELLE
ISLAND
STEVENS
CLALLAM
SNOHOMISH
CHELAN
JEFFERSON
DOUGLAS
LINCOLN
SPOKANE
KITSAP
KING
GRAYS HARBOUR
MASON
GRANT
KITTITAS
PIERCE
ADAMS
WHITMAN
THURSTON
FRANKLIN
LEWIS
GARFIELD
PACIFIC
YAKIMA
COLUMBIA
WAHKIAKUM
COWLITZ
WALLA WALLA
BENTON
ASOTIN
SKAMANIA
KLICKITAT
CLARK

Legend:

- High Potential
- Medium Potential
- Low Potential

Note:

Potential is based on the number of apple and pear trees in the county between 1905 and 1945

Washington Dept. Of Ecology Areawide Contamination Strategy Project	**Potential for Elevated Levels of Arsenic and Lead in Soil from Historical use of Lead Arsenate Pesticide**	Figure 1

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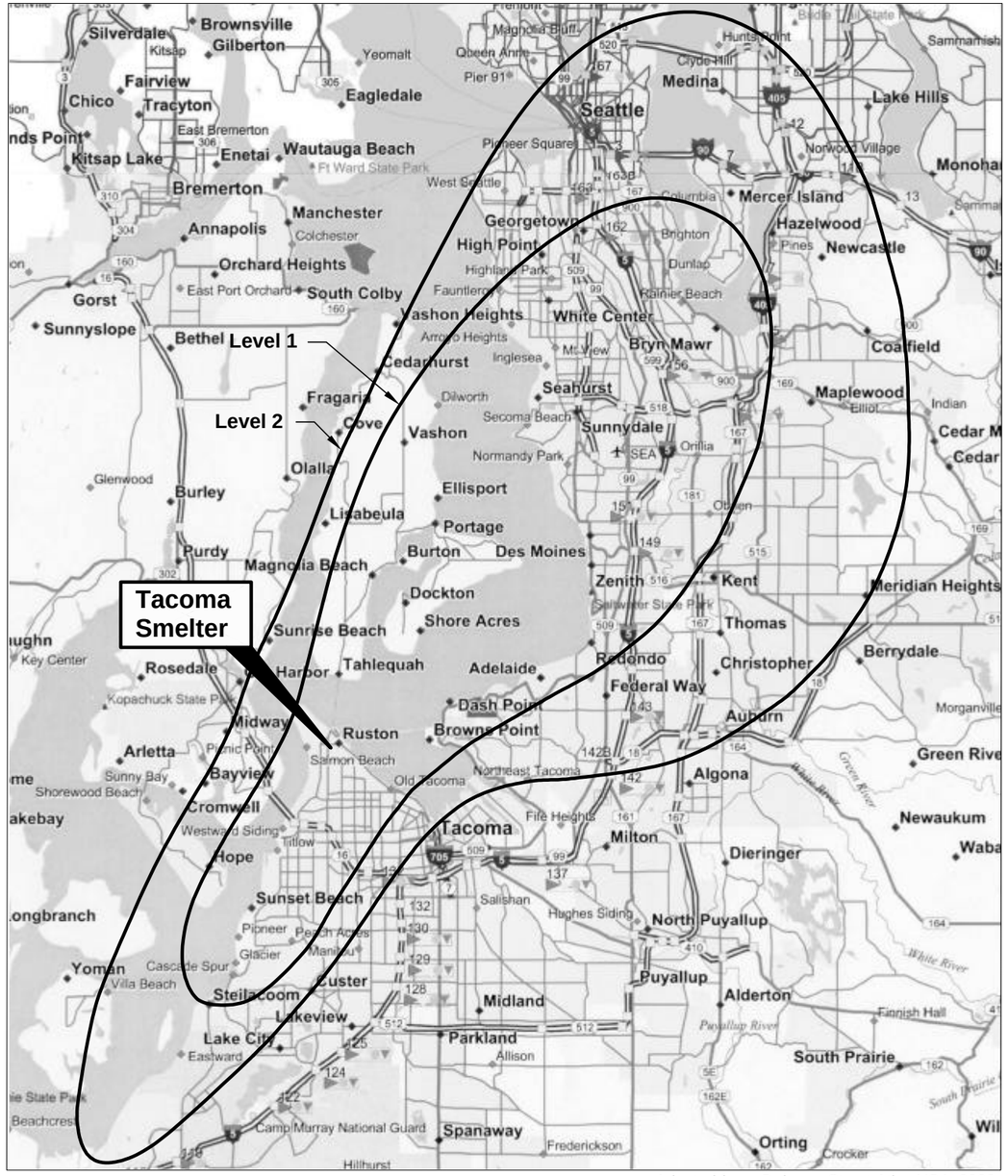
Ecology/Strategy Project/Tech Memo | T:\13800\3\210\Fig1.cdr 09/05/2002



Adapted from: Delorme Street Atlas USA, 2000

Legend

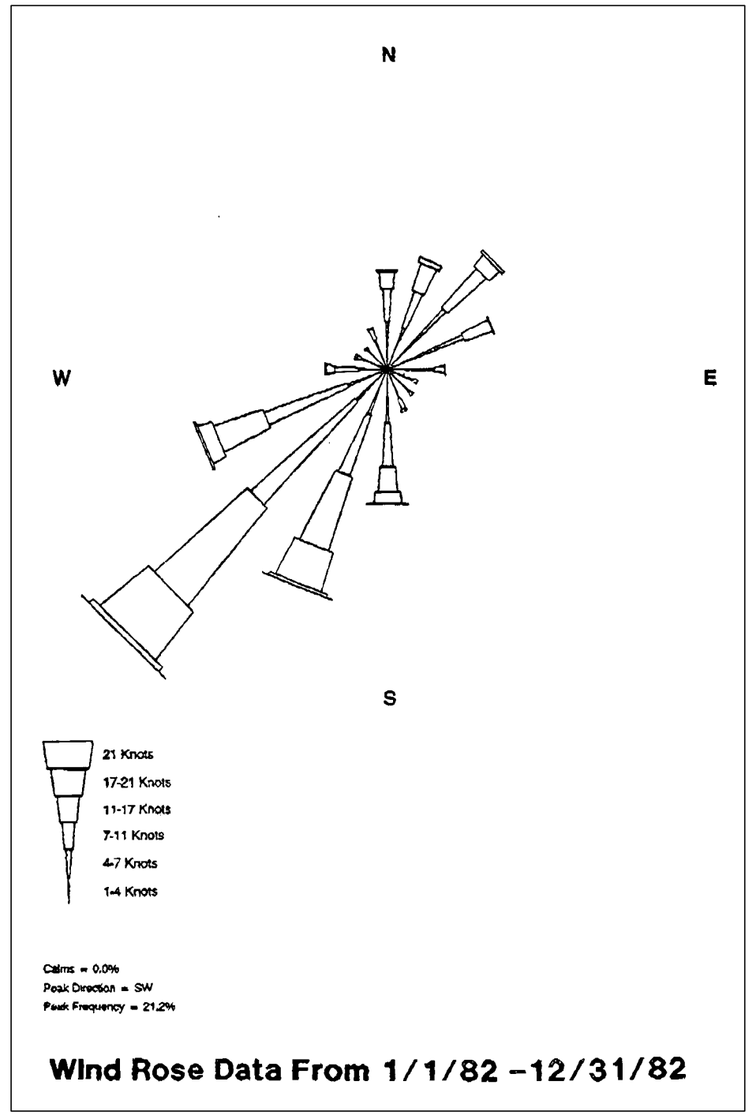
Level 1: Area Where Shallow Undisturbed Soil Likely Exceeds 20 mg/kg Arsenic

Level 2: Area Where Shallow Undisturbed Soil Occasionally Exceeds 20 mg/kg Arsenic

Data Sources:
Ecology, 2002
Glass, 2002

0 5 10

Approximate Scale in Miles



Source: Asarco Information Center
Station Location: Tacoma Smelter

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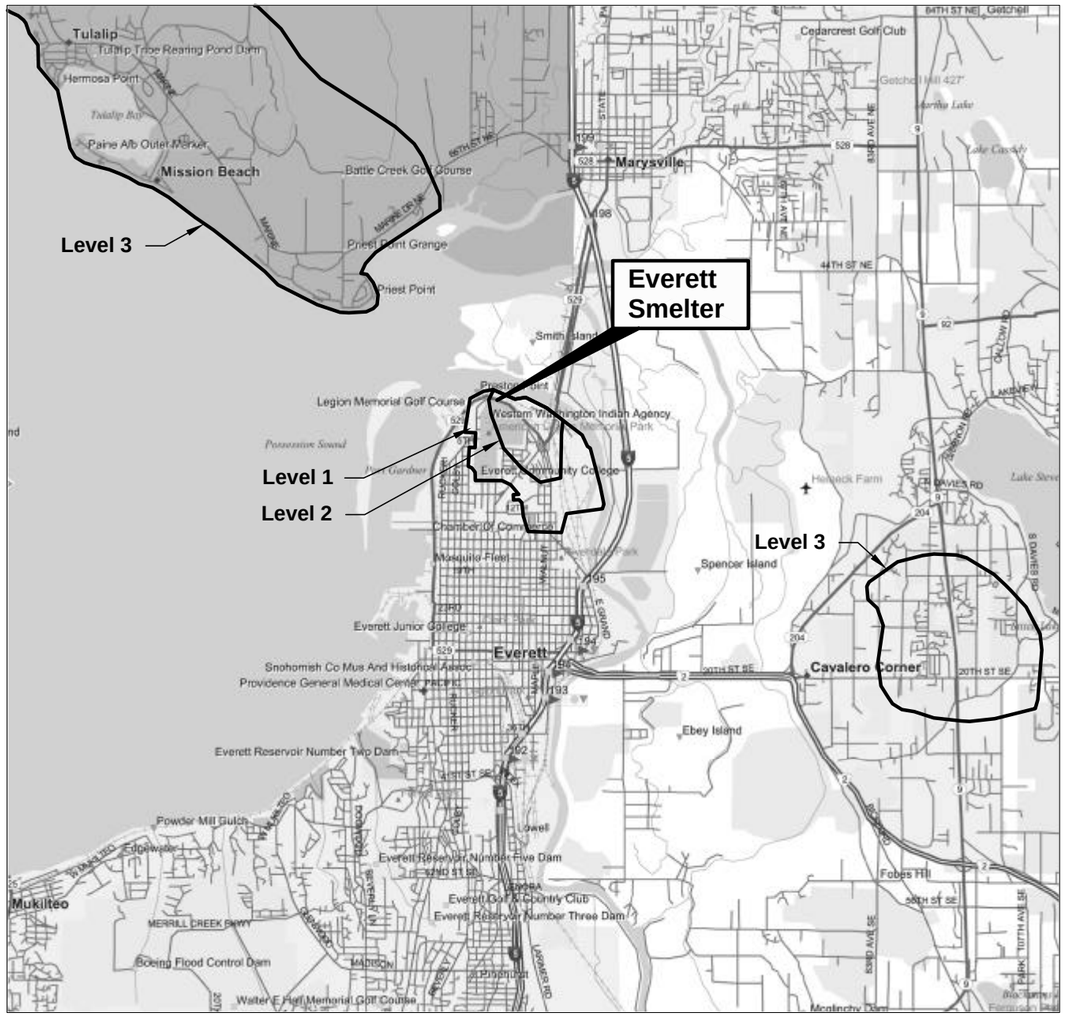
Area-wide Contamination Preliminary Estimates Task Washington Dept. of Ecology	**Preliminary Estimate of Area-wide Contamination: Tacoma Smelter**	Figure **2**

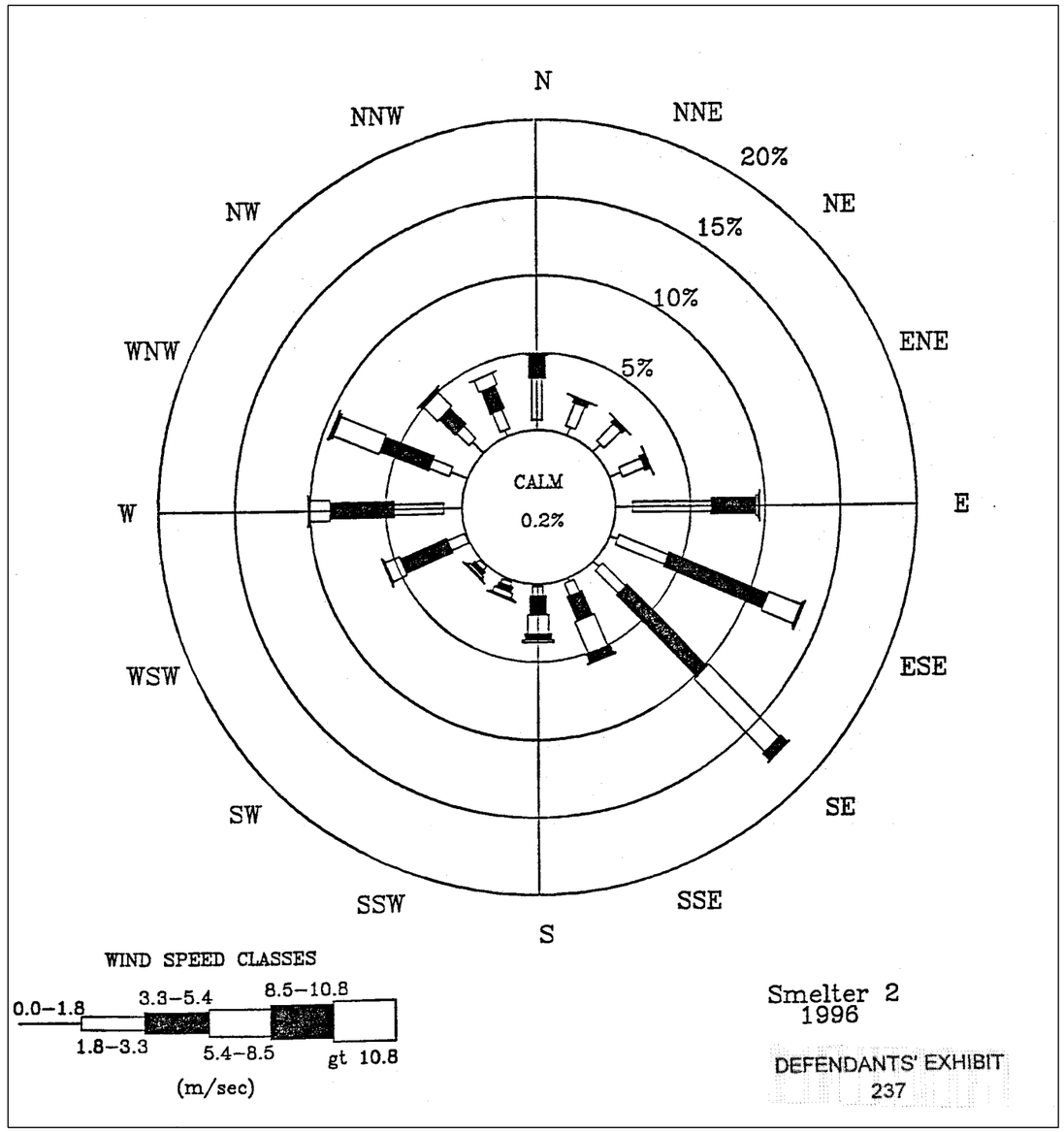
Ecology/Arsenic Project/Tech Memo | T:\1361\003342\Smelter Data Compilation-revised\Figs.dwg (A) "Figure 2" 8/19/2002



Adapted from: Delorme Street Atlas USA, 2000

0 1.5 3.0

Approximate Scale in Miles



Source: Scire 1999
Station Location: Everett Smelter Site

Legend

Level 1: Area Where Shallow Soil Likely Exceeds 20 mg/kg Arsenic

Level 2: Area Where Shallow Soil Occasionally Exceeds 20 mg/kg Arsenic

Level 3: Area Where Modeling Predicted Most Likely Particulate Deposition From Former Furnace Stack

Data Sources:
Ecology, 1999
Scire, 1999

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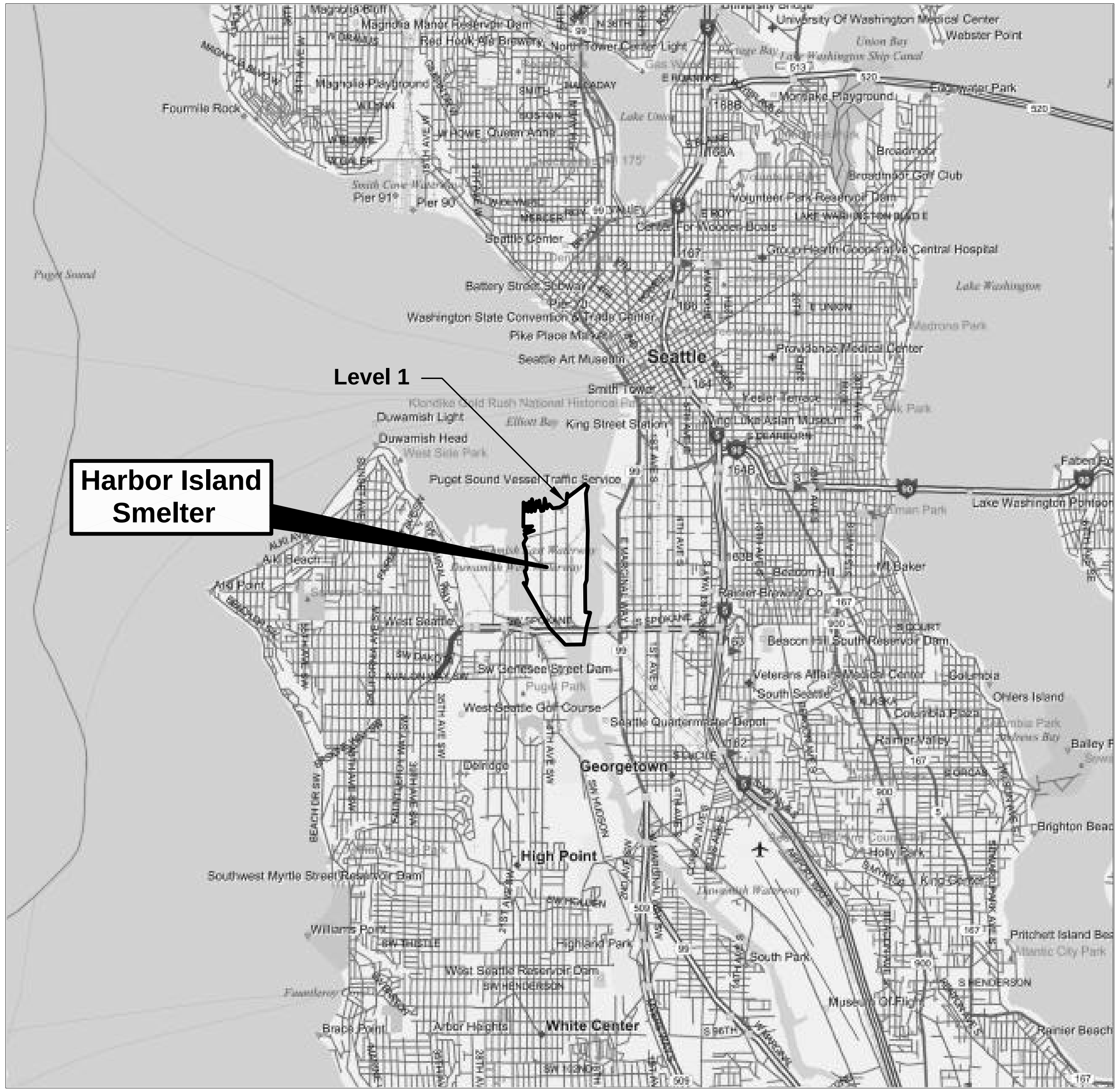
Area-wide Contamination Preliminary Estimates Task Washington Dept. of Ecology	**Preliminary Estimate of Area-wide Contamination: Everett Smelter**	Figure **5**

Ecology/Arsenic Project/Tech Memo | T:\1136\003\342\Smelter Data Compilation-revised\Figs.dwg (A) "Figure 5" 8/19/2002



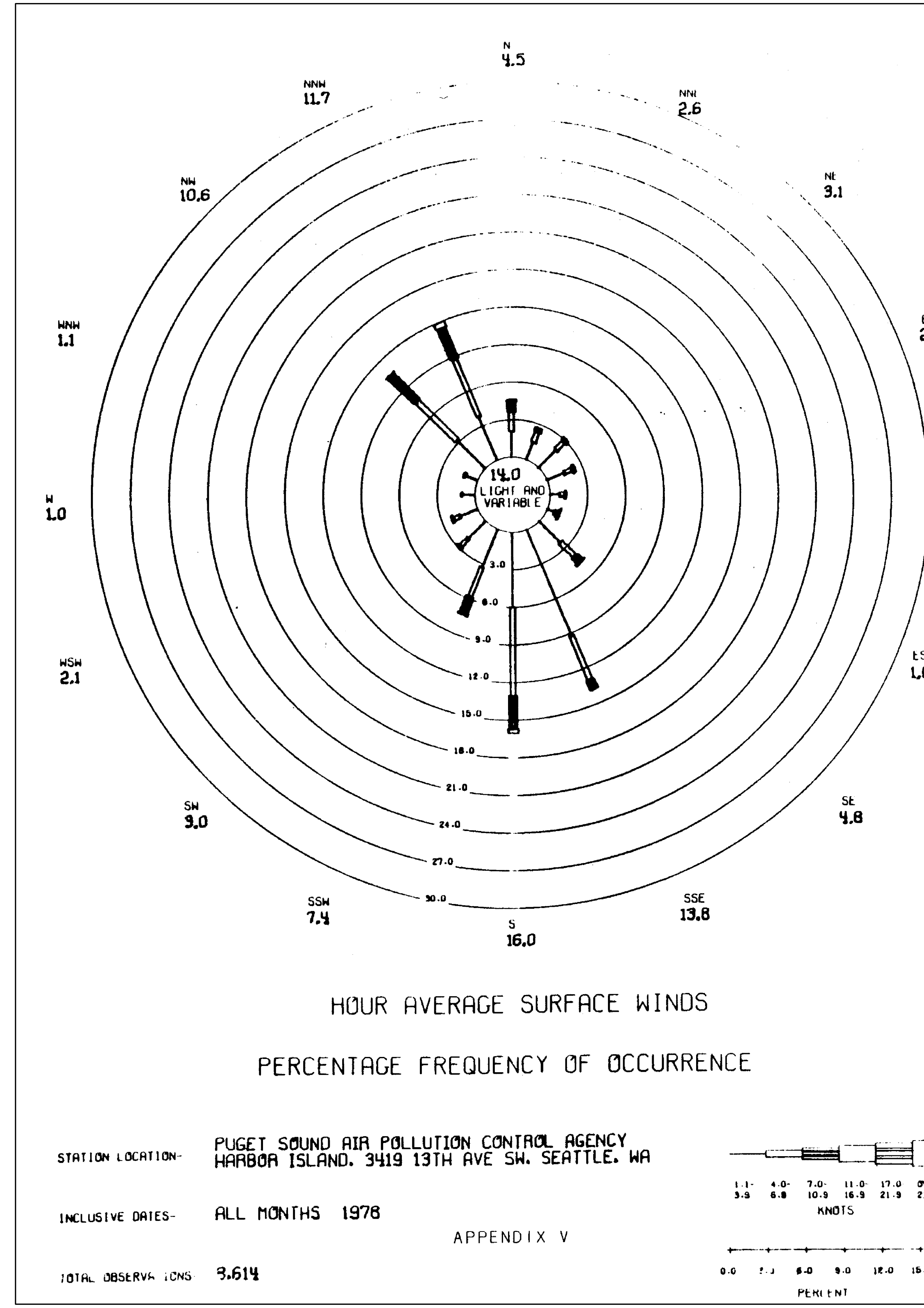
Adapted from: Delorme Street Atlas USA, 2000

0 1.5 3.0
Approximate Scale in Feet

Legend

Level 1: Area Where Shallow Soil Likely
Exceeds 250 mg/kg Arsenic

Data Source:
Weston, 1993



Source: PSAPCA 1980
Station Location: Harbor Island

Ecology/Arsenic Project/Tech Memo | T:\136\003\342\Smelter Data Compilation-revised\Figs.dwg (A) "Figure 6" 8/19/2002

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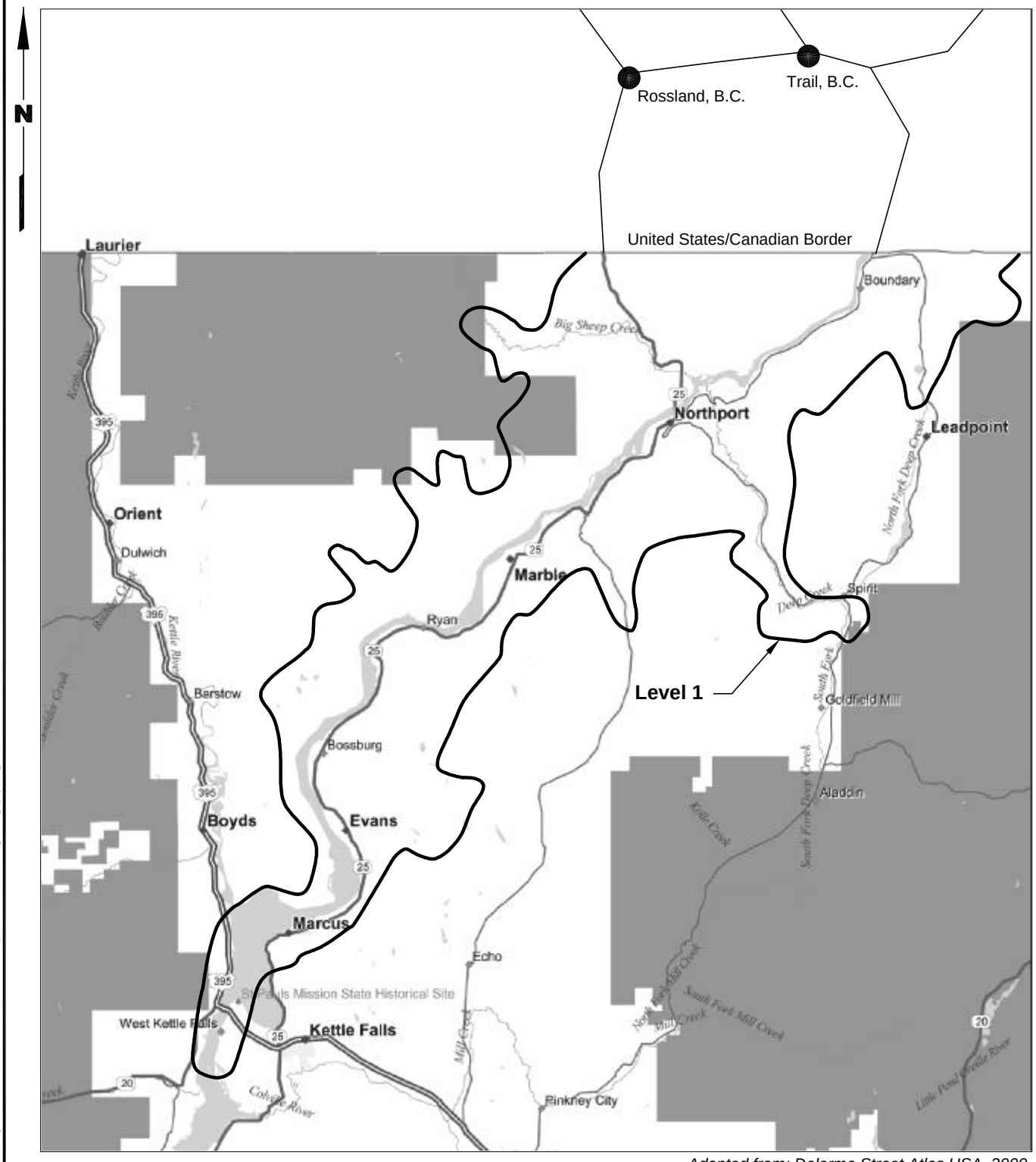
Area-wide Contamination Preliminary Estimates Task Washington Dept. of Ecology	**Preliminary Estimate of Area-wide Contamination: Harbor Island**	Figure 6



Adapted from: Delorme Street Atlas USA, 2000

Legend

Level 1: Area Where Smelter Smoke Damage to Vegetation Documented in 1929. Damage Attributed to SO_2 Emissions.

Source: After Wirth, 2000

0 5 10

Approximate Scale in Miles

Ecology/Arsenic Project/Tech Memo | T:\1361\003\342\Smelter Data Compilation-revised\Figs.dwg (A) "Figure 7" 8/19/2002

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Area-wide Contamination Preliminary Estimates Task Washington Dept. of Ecology	**Preliminary Estimate of Area-wide Contamination: Trail and Northport Smelters**	Figure **7**